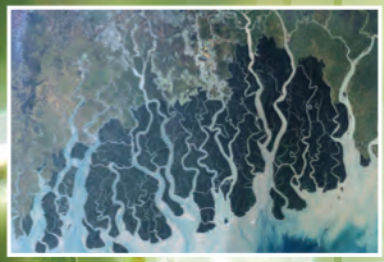
National Aeronautics and Space Administration



DEVELOP National Program

WATER

Choptank Watershed Water and Disasters

Comparing Multiple DEM Sources and Spatial Resolutions for Hydrologic Model Performance and Accuracy in the Choptank Watershed

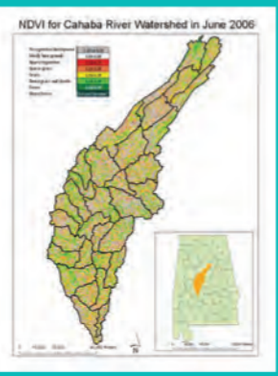
Surface water inundation is a key factor controlling the provision of multiple ecosystem services. Passive remotely sensed data have been used to map inundation, but these sensors are not well suited for the detection of inundation below the canopy level in forests. Active sensors, including LiDAR, have been successfully used to detect inundation below the forest canopy. LiDAR intensity data can be used to create accurate maps of forest inundation and LiDAR-based digital elevation models (DEMs), which are core components to hydrological models. Other types of remotely sensed data have been used to create DEMs, but the accuracy of these DEMs is limited by spatial resolution and the inherent nature of the sensors used to collect this information. The model used in this study is the Coupled Routing and Excess STorage (CREST) hydrological model. The inputs for the CREST model are the DEM, flow direction, flow accumulation, rainfall, and potential evapotranspiration data. These parameters were used to model potential flooding based on the slope and gradient of the contributing area. Using high-resolution DEMs may increase the accuracy of the CREST model. This project quantified the impacts of DEM spatial resolution and quality on the ability to model potential inundation in forested ecosystems. The team parameterized a terrain-based model of potential inundation using LiDAR, InSAR Shuttle Radar Topography Mission, and NED-based DEMs at multiple spatial resolutions and validated the CREST model results using a field-validated, LiDAR intensity-based map of inundation developed for forested ecosystems within the Greensboro Watershed, MD. The resolution of rainfall and potential evapotranspiration data for Greensboro is coarse, and the team investigated finer-resolution data inputs for modeling. Study results will contribute to an enhanced understanding of the drivers controlling surface water inundation and improved techniques for modeling inundation for the assessment of ecosystem services and mitigation of flood impacts.

WATER

Central Valley Water

Analysis of Groundwater Storage Using GRACE Satellite Data: A Comparison of Modeled and Satellite Datasets for Accuracy Improvement

The Gravity Recovery and Climate Experiment (GRACE) measures changes in total water storage (TWS) remotely. From October 2002 to September 2009, GRACE was used to map changes in TWS for hydrological regions encompassing the Central Valley aquifer. Net groundwater storage changes were calculated by incorporating estimates for additional components of the hydrological budget including precipitation, evapotranspiration, soil moisture, snowpack, and surface water storage. The calculated changes in groundwater storage were then compared to simulated values from the California Department of Water Resources' Central Valley Groundwater-Surface Water Simulation Model and their Water Data Library (WDL) Geographic Information System (GIS) change in storage tool.



Alabama Water and Ecology

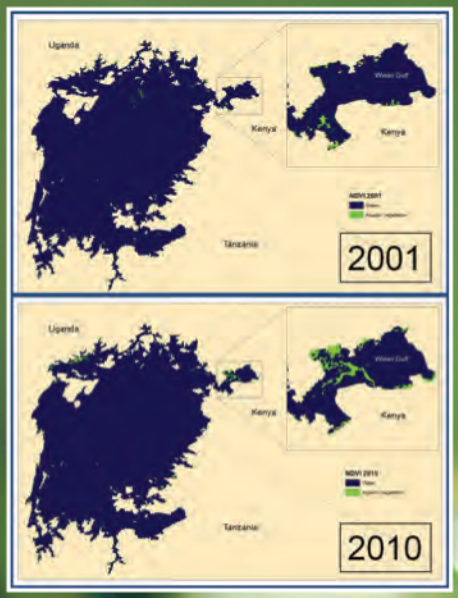
Estimation of the Urban Growth Impacts on River Ecosystems with Using Remote Sensing and GIS Techniques: A Case Study of Cahaba Watershed Area

Increased urbanization around the Cahaba River has led to increased surface runoff and sedimentation, which are both detrimental to the health of the river, specifically the wildlife. This project partners with the Cahaba River Society to investigate the effects of urban growth on fish, mussel, amphibian, and snail populations and habitats through spatiotemporal analysis utilizing remote sensing and GIS technologies. The DEVELOP Team integrated remotely sensed data, ground truth data on species, and socioeconomic and physical factors into a GIS framework to analyze the impact on the watershed. Findings and end products will be vital to policy makers for the Cahaba River Society, City of Birmingham, and Alabama Department of Environmental Management in the development of conservation strategies and new land use plans pertaining to the Cahaba River watershed.

Kenya Water and Ecology

Satellite-Based Assessment of Water Hyacinth Change in Lake Victoria

Water hyacinth has plagued Lake Victoria since 1988. Since its introduction into the lake, water hyacinth has become present in a majority of the coastal areas of Kenya, Tanzania, and Uganda. This project will use NASA satellite imagery to track and map aquatic vegetation in Lake Victoria from 2000 to 2011. Our research will be used to assess the effectiveness of previous water hyacinth control methods. The methodologies of this study will be delivered to SERVIR and other partner agencies to assist future aquatic vegetation monitoring using NASA satellite imagery.



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